TEXAS ASSOCIATION OF CLEAN WATER AGENCIES
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A CLEAR COMMITMENT TO TEXAS WATERS

ARCADIS Design & Consultancy for natural and built assets

OVERCOMING WRRF WET WEATHER TREATMENT CHALLENGES

Ed Becker

Arcadis

January 28, 2022 | City of Garland, TX

AGENDA

Wet weather treatment challenges

Wet weather treatment alternative strategies

Case Study

Wrap Up

WET WEATHER CHALLENGES

Wet Weather Treatment – Location Options

Satellite

+ Conveyance Issues
- New Site and Treatment Facilities
- Remote Operations
- Solids Management

WRRF

• Additional Conveyance?
+ Existing Site or Process Units
+ Facility is staffed
+ Solids Management on-site

WRRF typically offer the most cost effective means to manage higher flows

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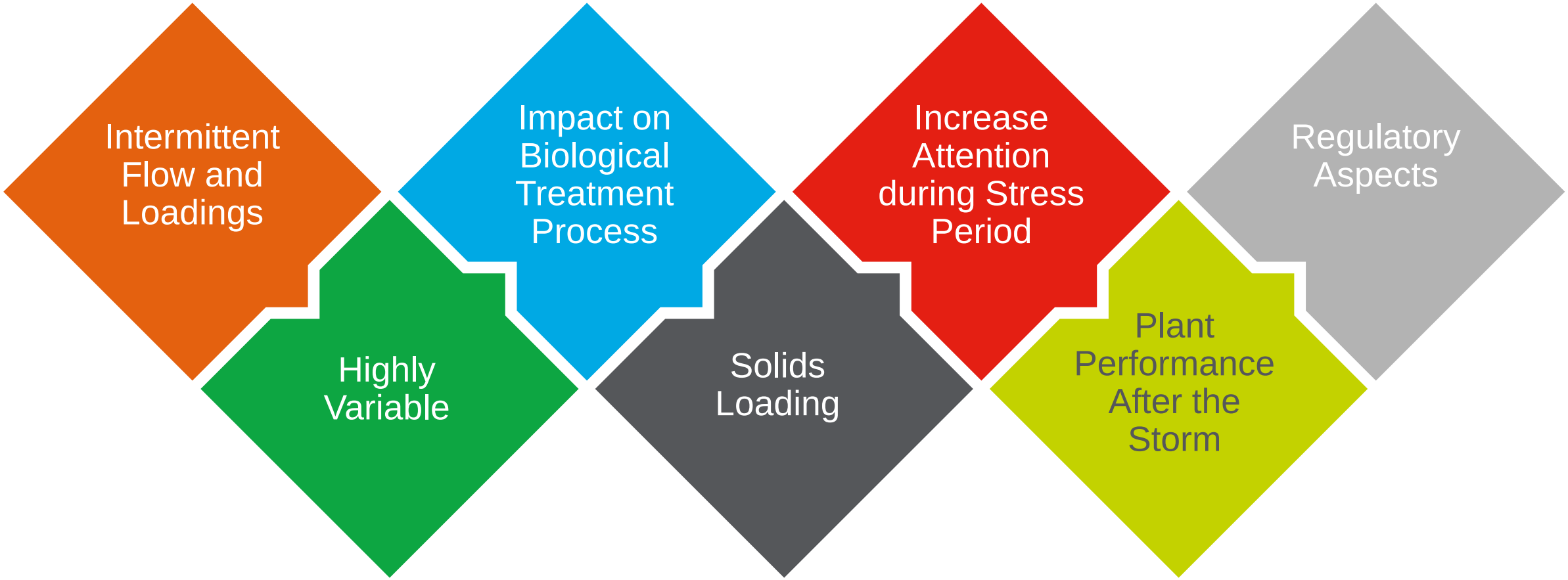
Wet Weather Challenges at WRRF



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Permit Challenges for Additional Flows at WRRF

WRRFs have stringent effluent WQ discharge limits – challenge at high flows

Effluent discharge total effluent load

Extended Events & Recovery

Key is discussing these issues with the Regulatory Agency

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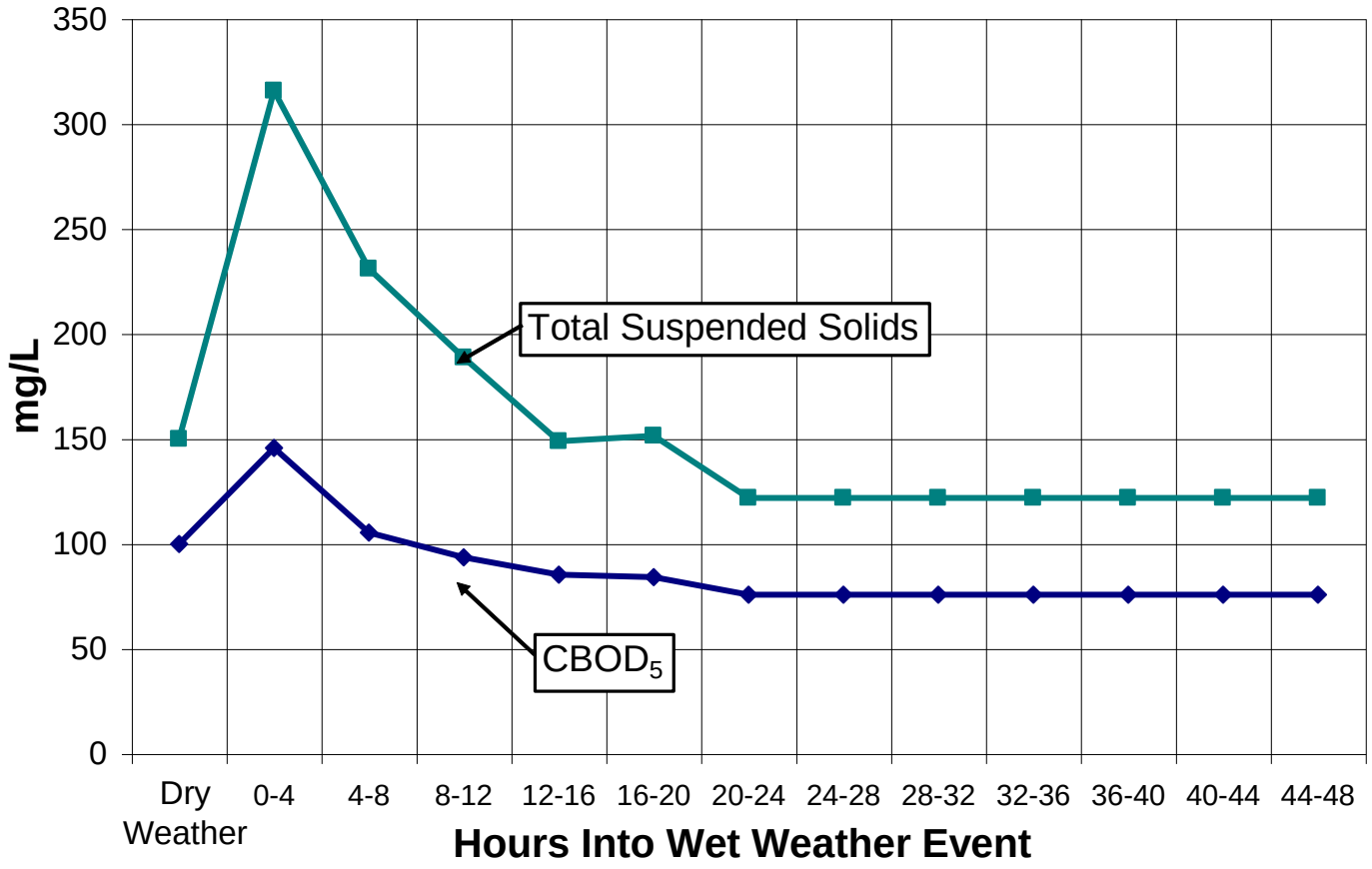
Conveyance System Impact on WRRF

- Increase Volume to WRRF
- First Flush Loadings
- Solids Loading



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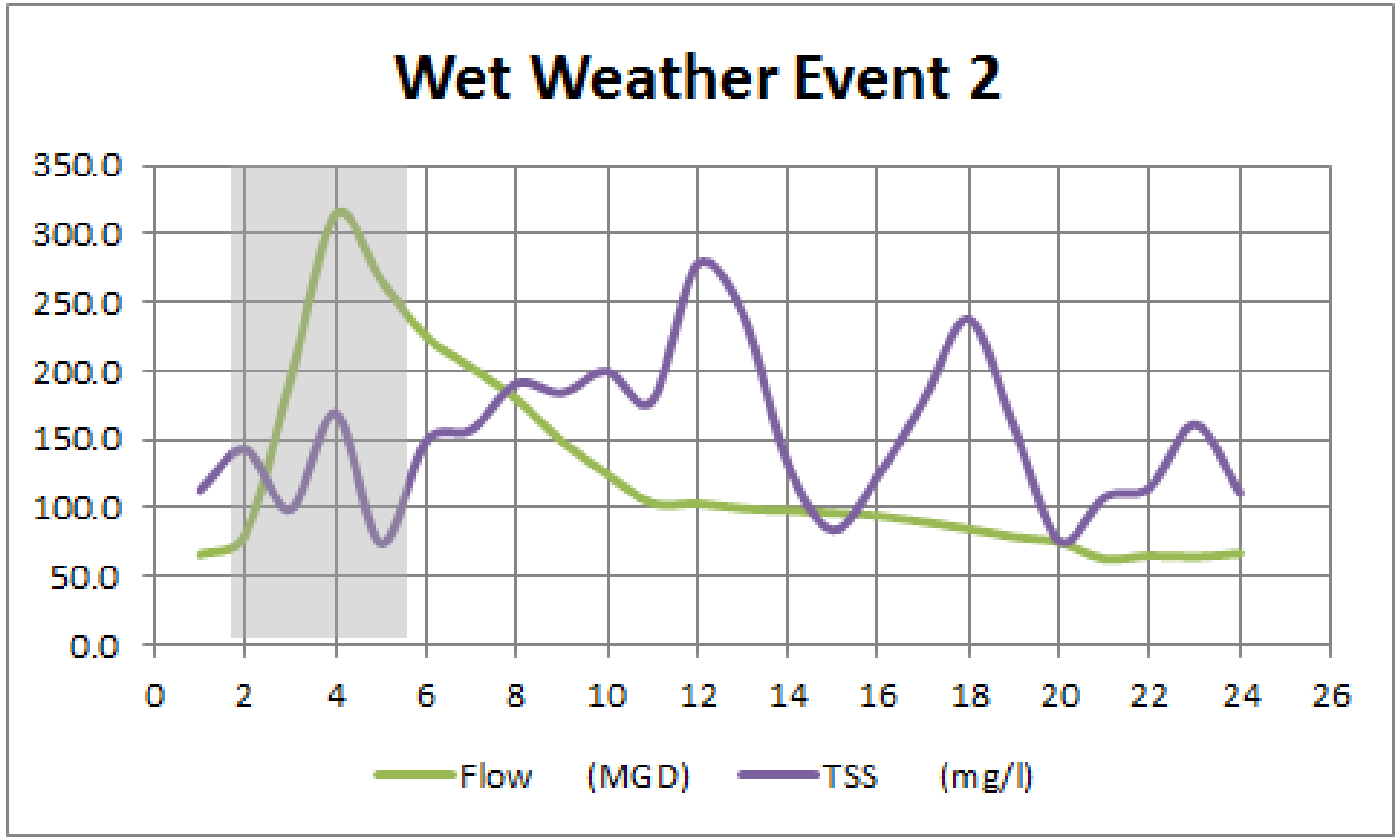
First Flush Phenomenon



Everywhere is Different

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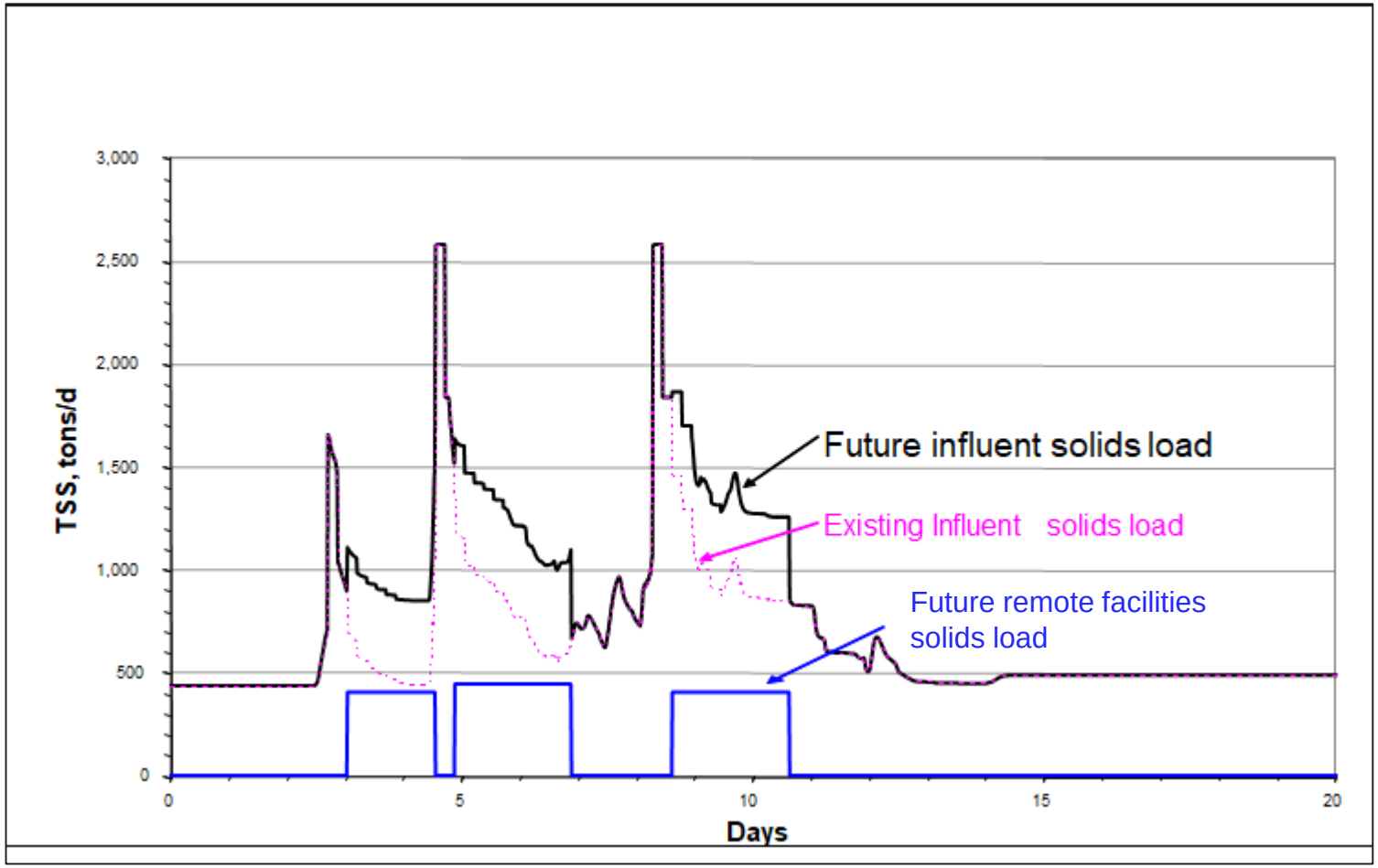
Wet Weather Solids - Remote Facility Impact

Wet weather influent solids profile changes significantly due to remote facility capture of solids



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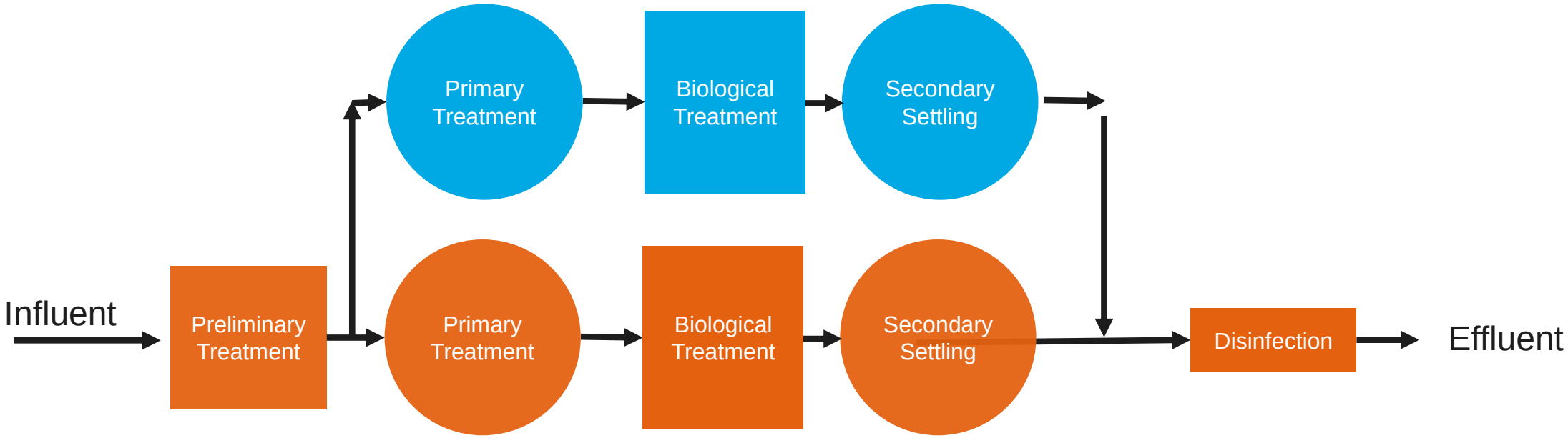
WET WEATHER TREATMENT ALTERNATIVE STRATEGIES

Alternative Treatment Options - Expand In Kind



Examples: Flow through the Biological process limited to 150% to 250% x Permitted Flow

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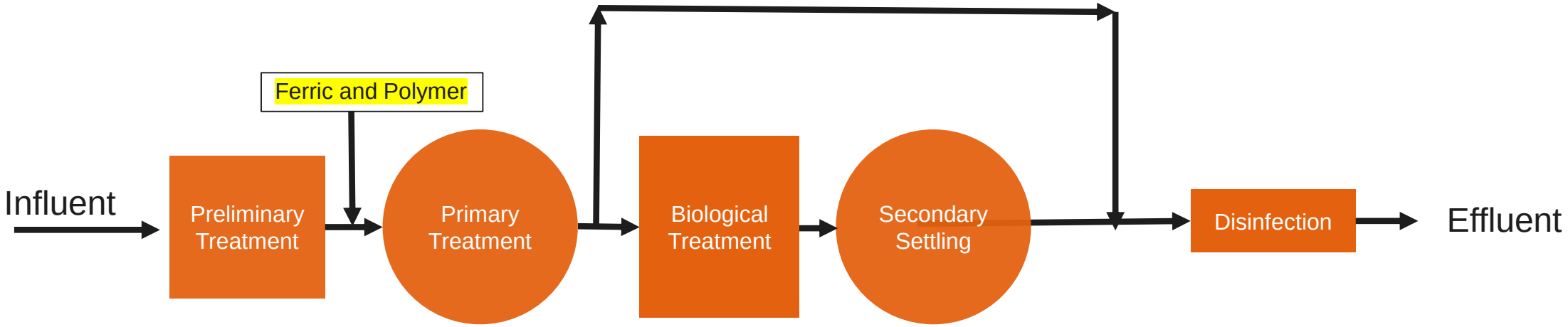
Alternative Treatment Options – CEPT/Blending



Enhanced primary treatment to achieve blended effluent quality needs.

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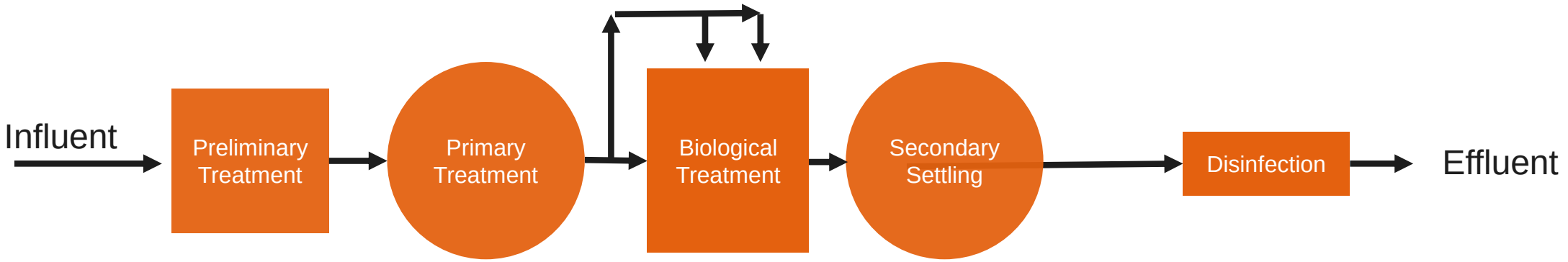
Alternative Treatment Options - Reconfigure



Examples: Step-feed Capability; In-Series-to-Parallel Treatment

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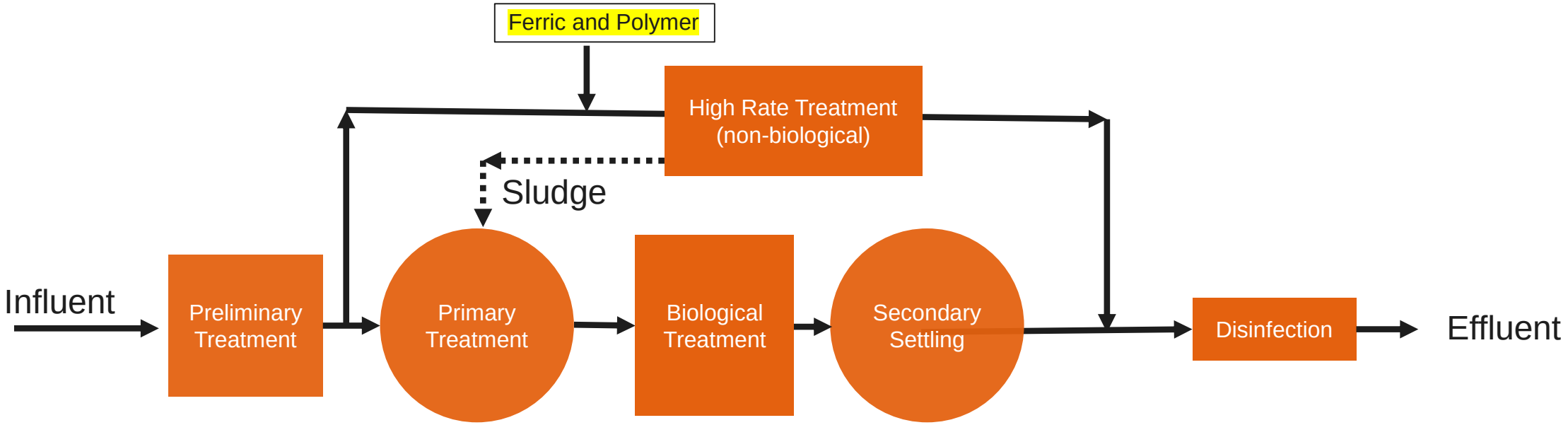
Separate Wet Weather Treatment



Examples: Higher level of treatment required to achieve blended effluent quality

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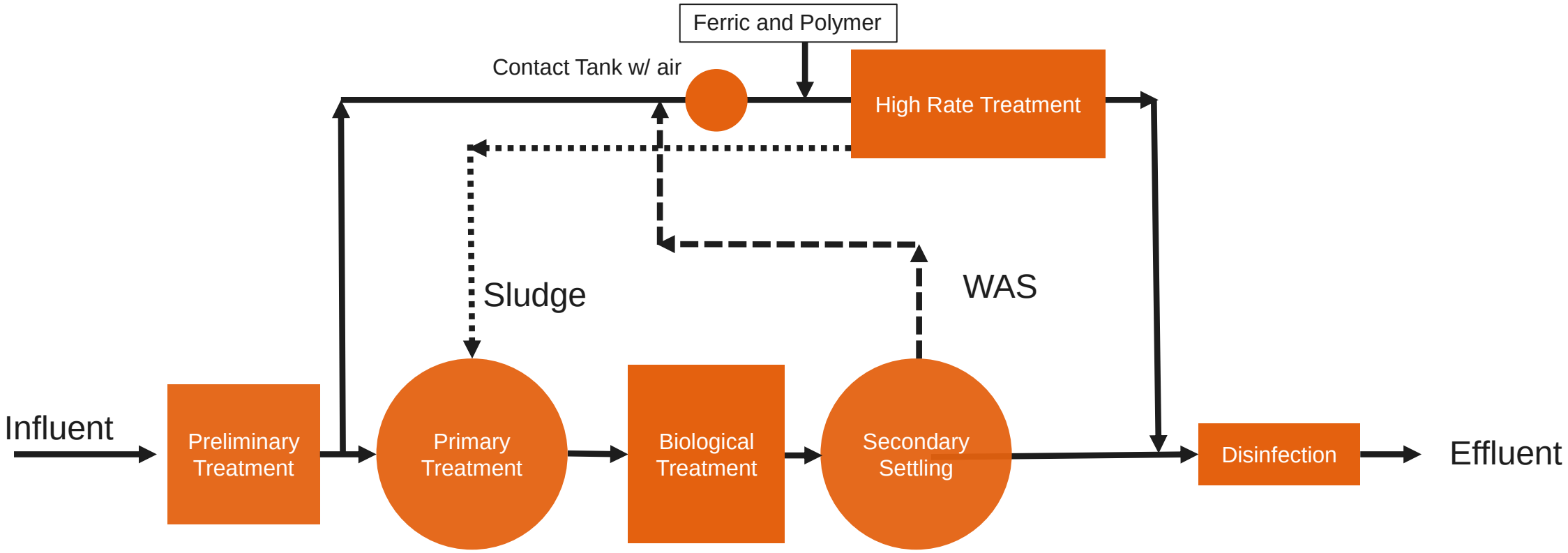
Biological + HRT



Examples: Higher level of treatment required to achieve blended effluent quality

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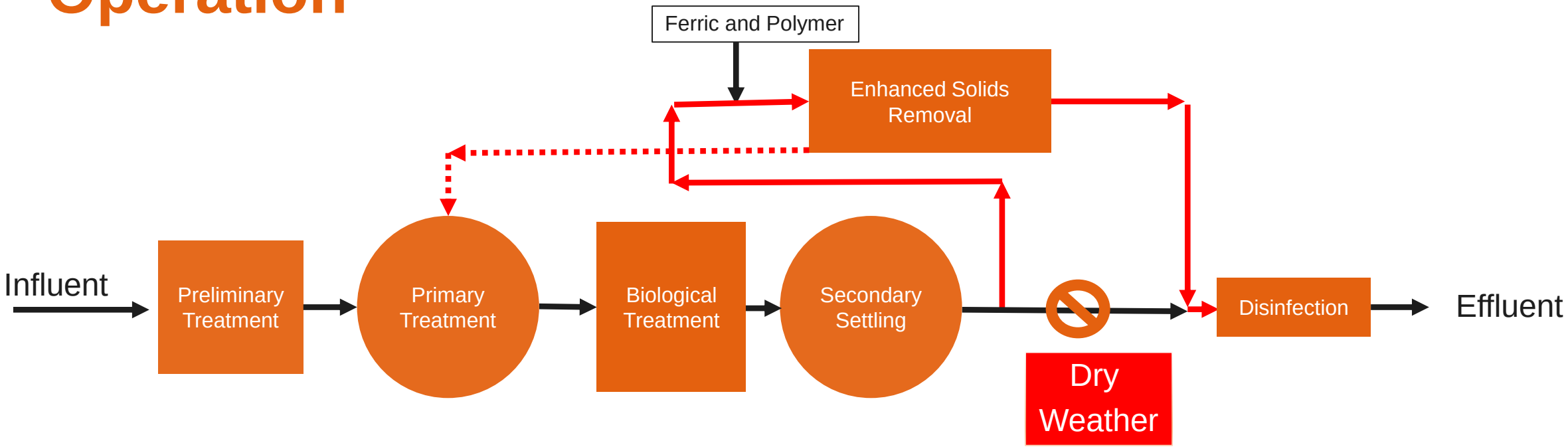
Dual Use High-Rate Treatment – Dry Weather Operation



Dual Use – Implemented for Stringent TP/TSS Requirements

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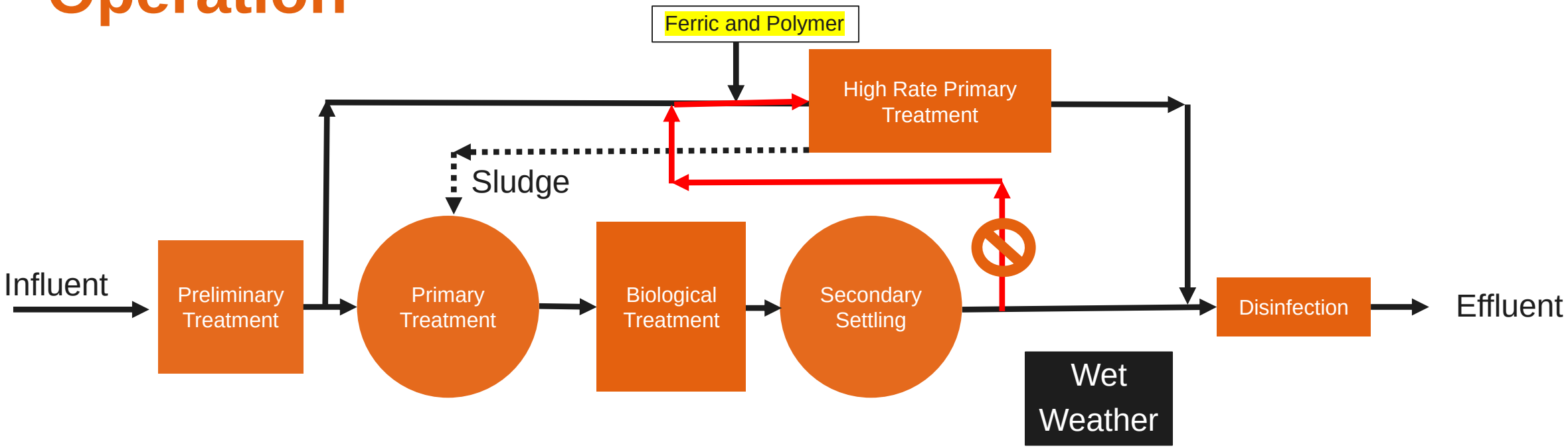
Dual Use High-Rate Treatment – Wet Weather Operation



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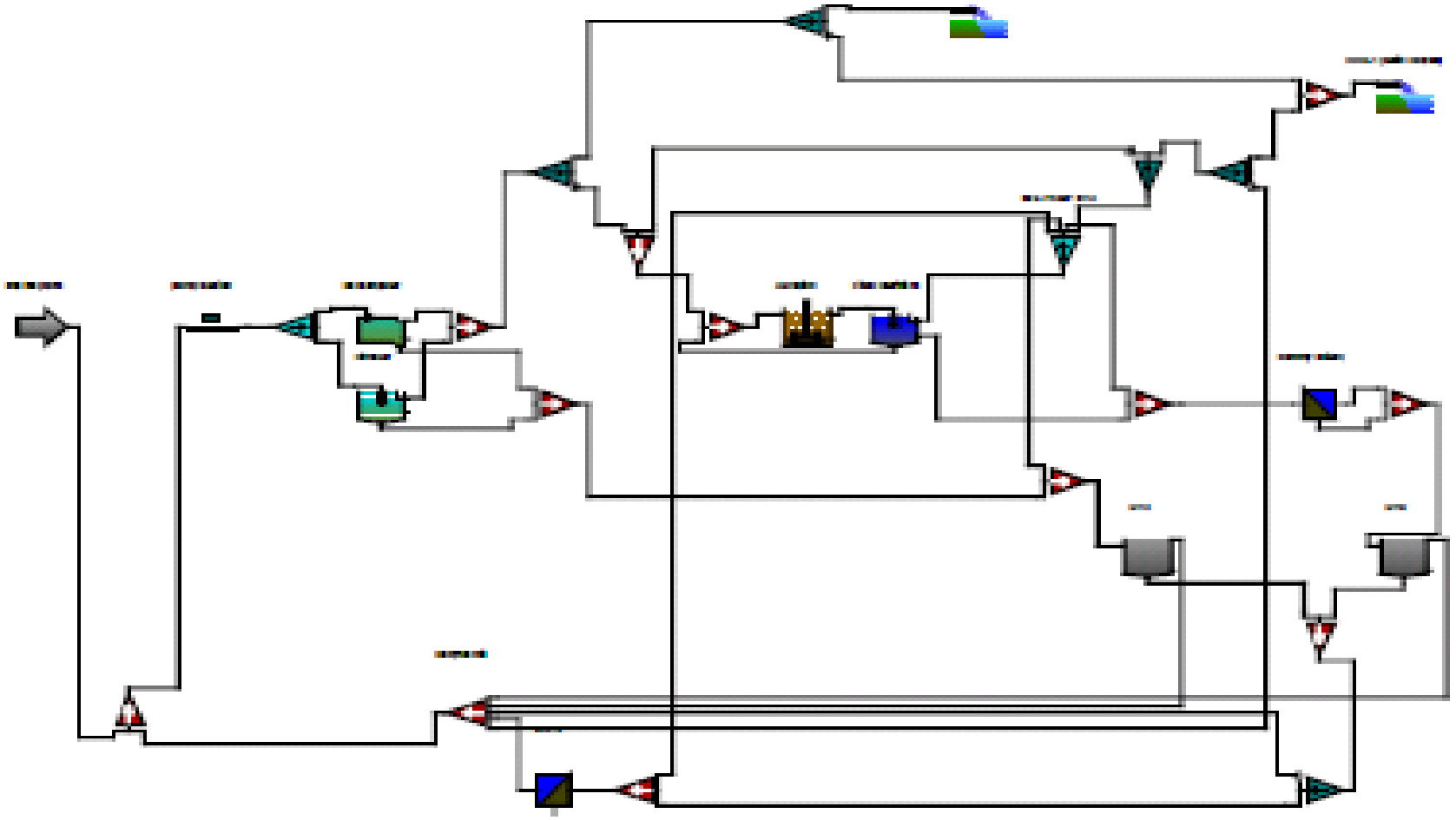
How to Evaluate WRRF Wet Weather Performance?

→ Dynamic Process Modeling



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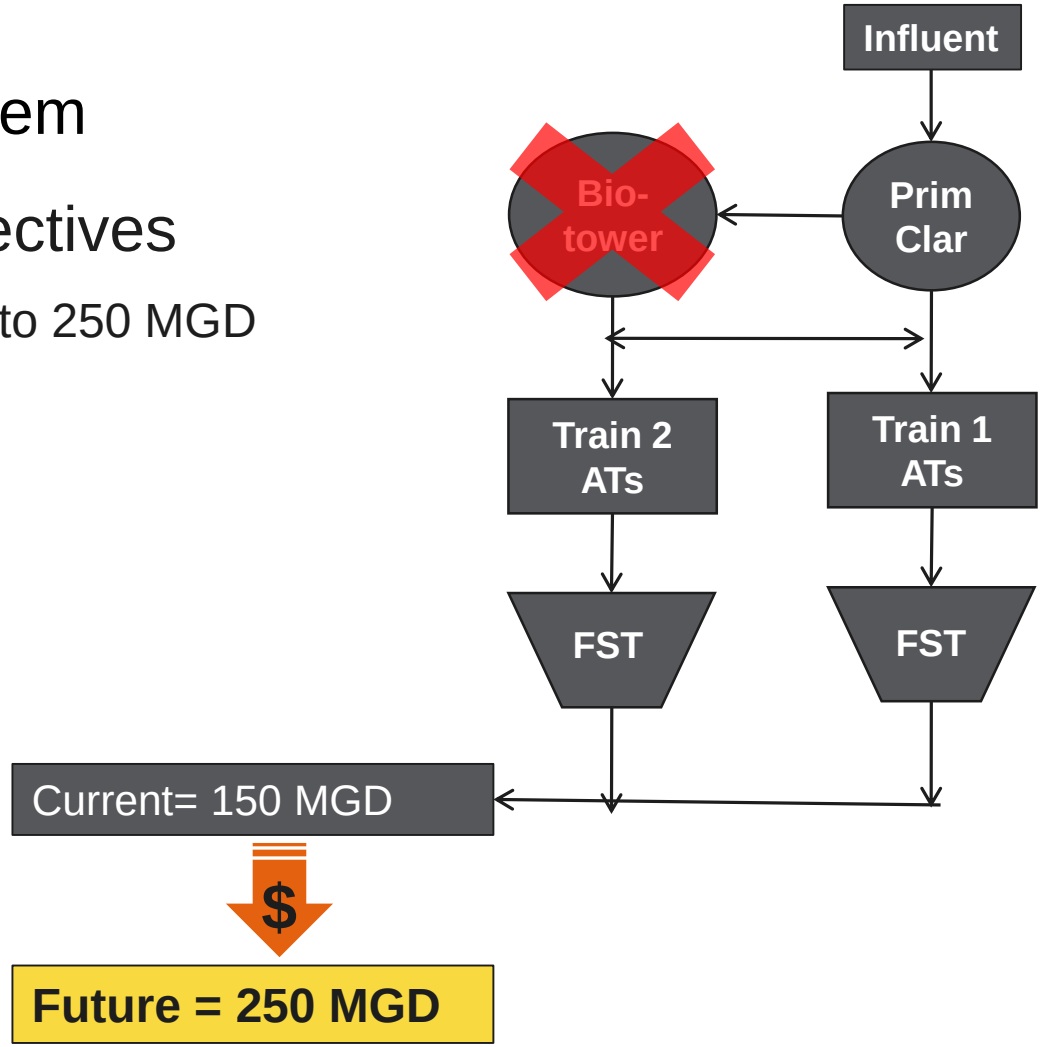
WET WEATHER TREATMENT CASE STUDY

Wet Weather Expansion Planning

- Two-Train Parallel Treatment AS System
- Wet Weather Expansion Project Objectives
  - Expand WRRF peak capacity from 150 MGD to 250 MGD
  - Reduce cost
  - Decommission Biotowers (~$10M rehab.)
  - Maintain nitrification year-round



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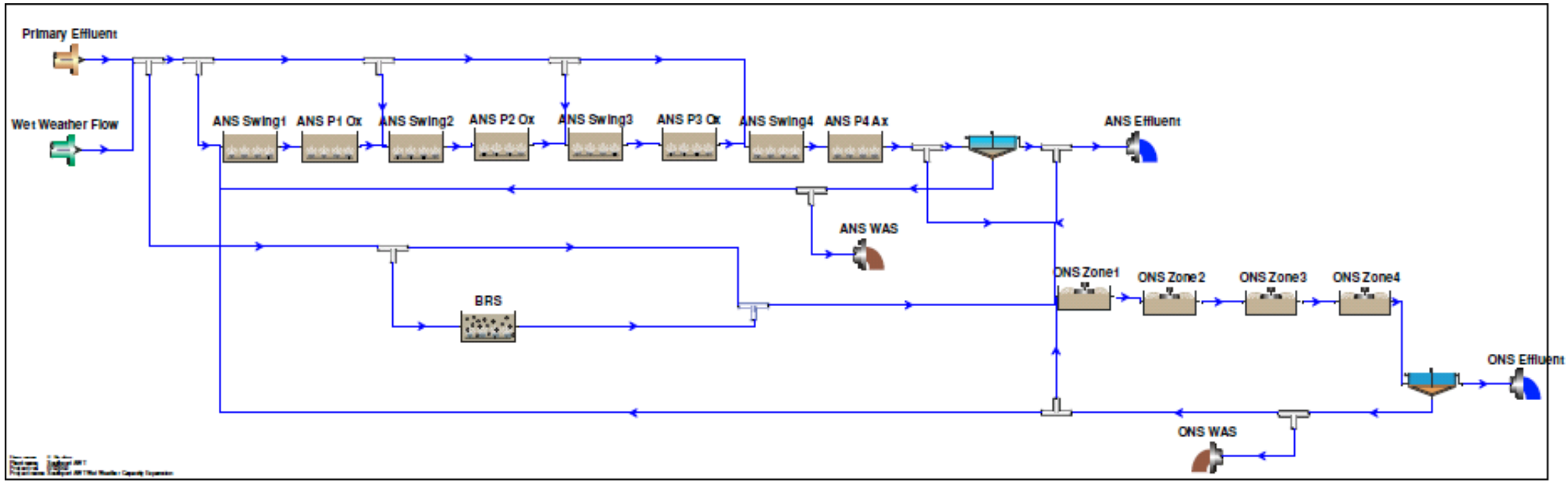
Dynamic Modeling to Evaluate Performance



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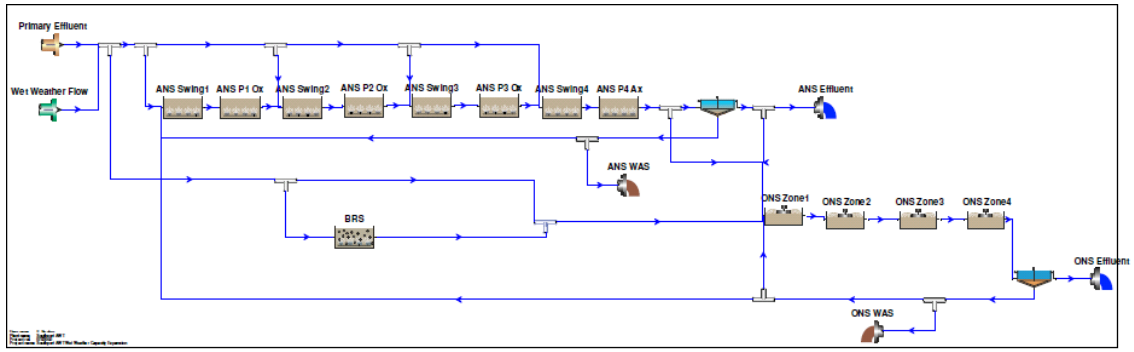
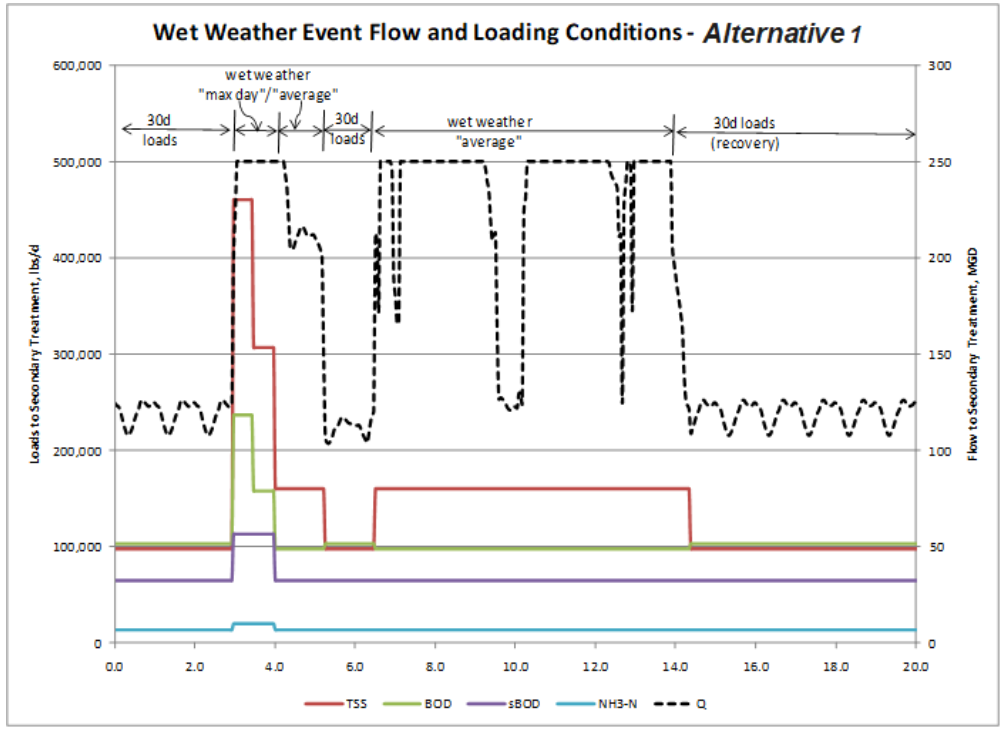
Wet Weather Expansion Planning

- Create model of WRRF
- Develop wet weather model input
- Perform modeling





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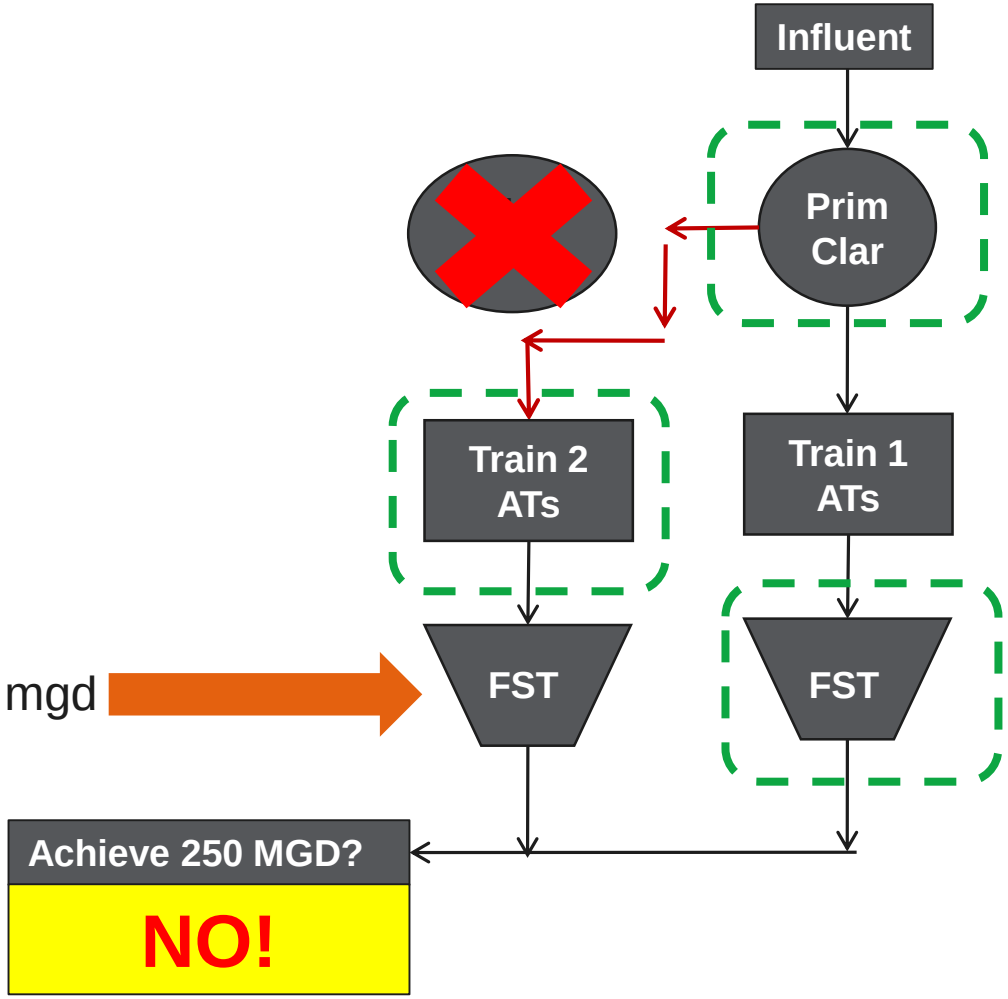
Modeling Identified Treatment Bottlenecks

Treatment Bottlenecks:

- Limited primary clarifier capacity
- Train 1 FSTs too small
- Train 2 ATs too small

Train 2 FSTs can potentially manage full 250 mgd



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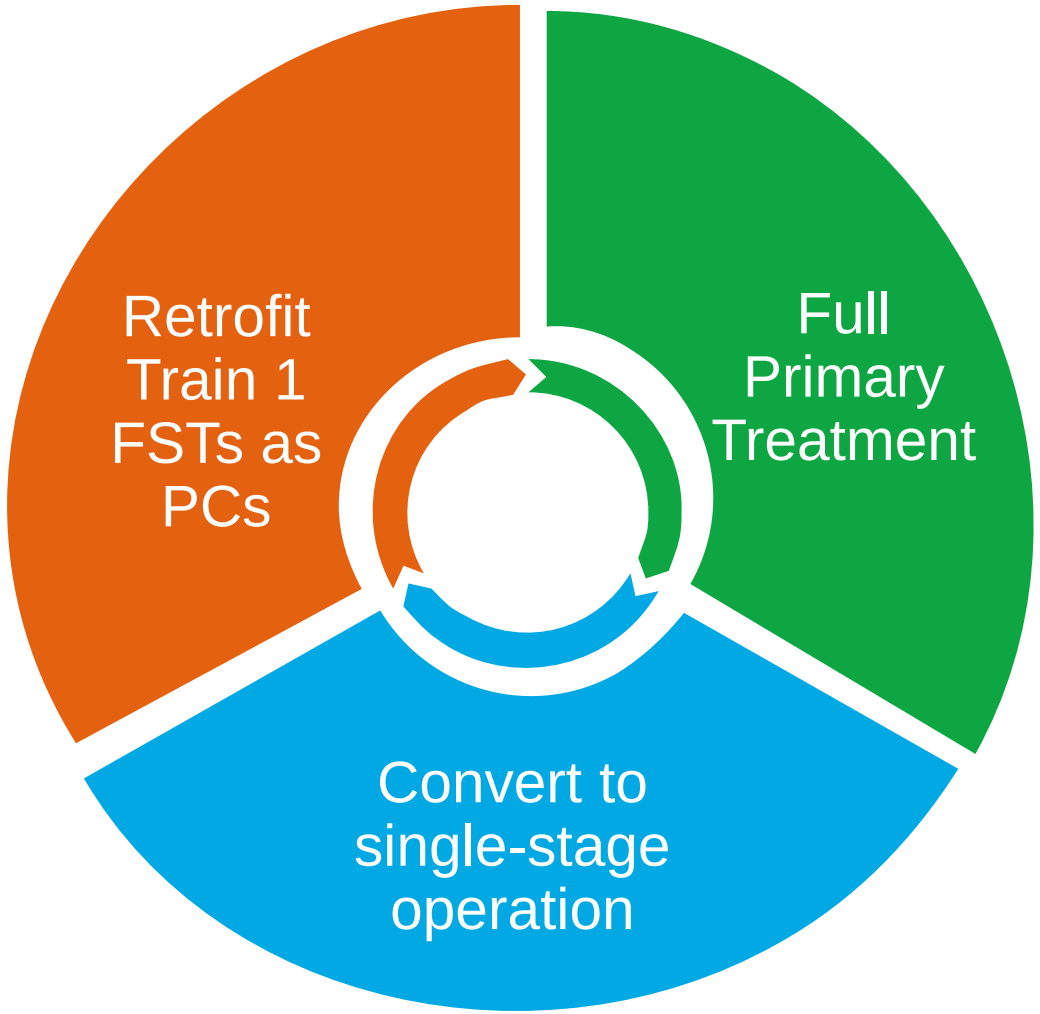
Modeling Conclusions and Recommendations



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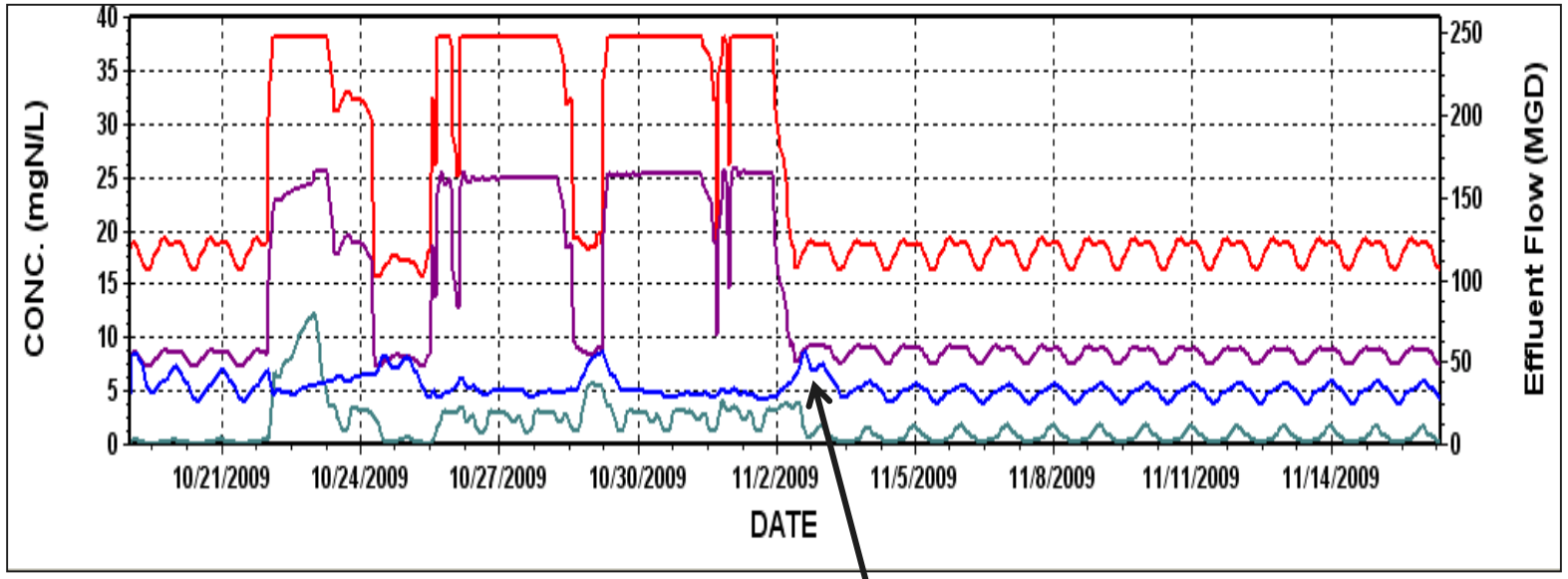
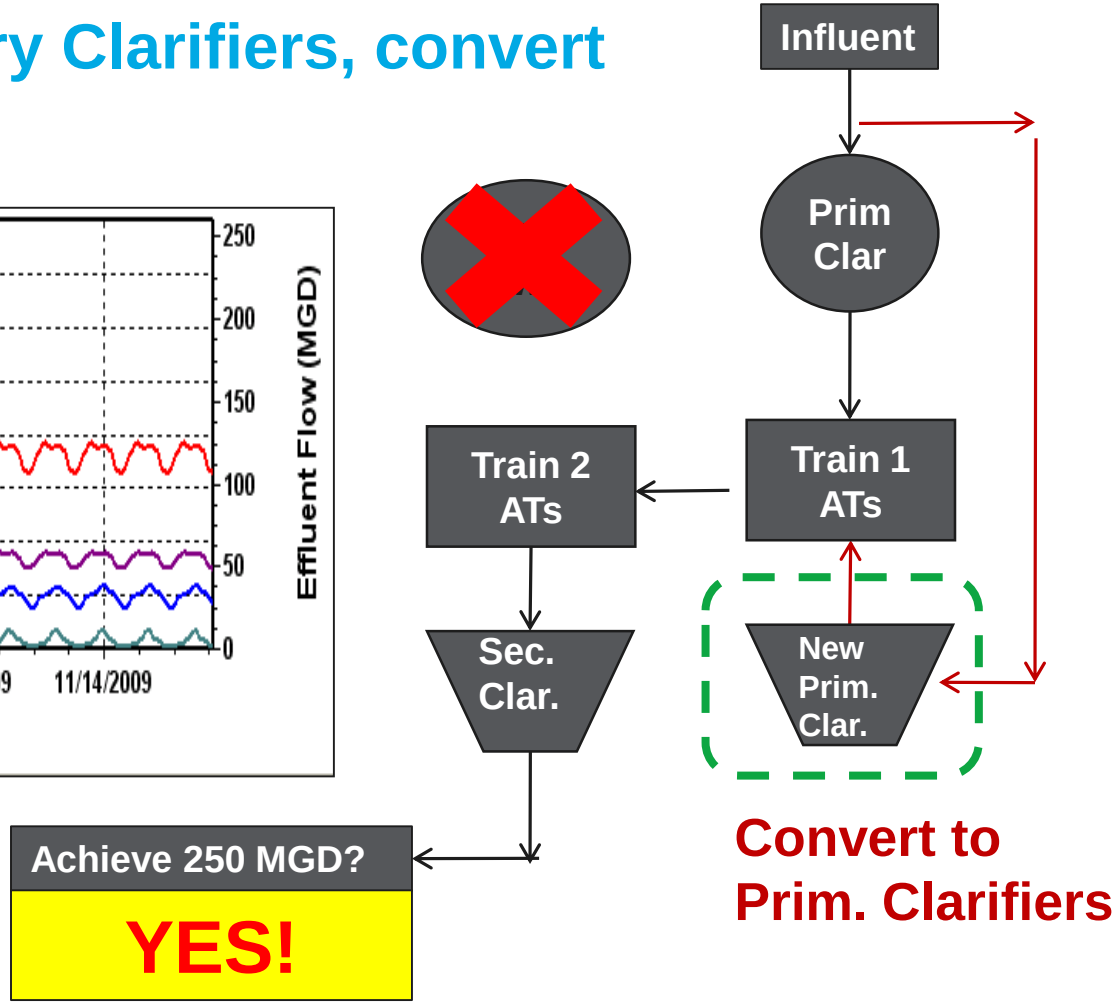
Wet Weather Expansion Planning

Solution: convert Train 1 FSTs to Primary Clarifiers, convert to single-aeration-train operation



Lower PE loads + single-train operation allowed system to maintain nitrification, immediate recovery post-storm.



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Model Value to Wet Weather Expansion Project

- Helped develop an effective wet weather expansion plan, that:
  - Met all project objectives
  - Maximized utilization of existing assets
- Provided understanding of interplay between peak flows, primary & secondary treatment performance
- Model utilized to provide subsequent preliminary design assistance

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Wrap Up

Wet Weather Treatment At WRRFs

Full understanding of the Dynamic Conditions

- Influent Quality
- Liquid Treatment – Hydraulic and Process Capacities & Interactions
- Solids Handling

Permit Condition

- Recognize impacts to managing additional flow at WRRF

Treatment Technology

- Look for Synergistic Technologies for both Dry and Wet Weather Treatment

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Questions/Discussion

Today's Presenter(s)

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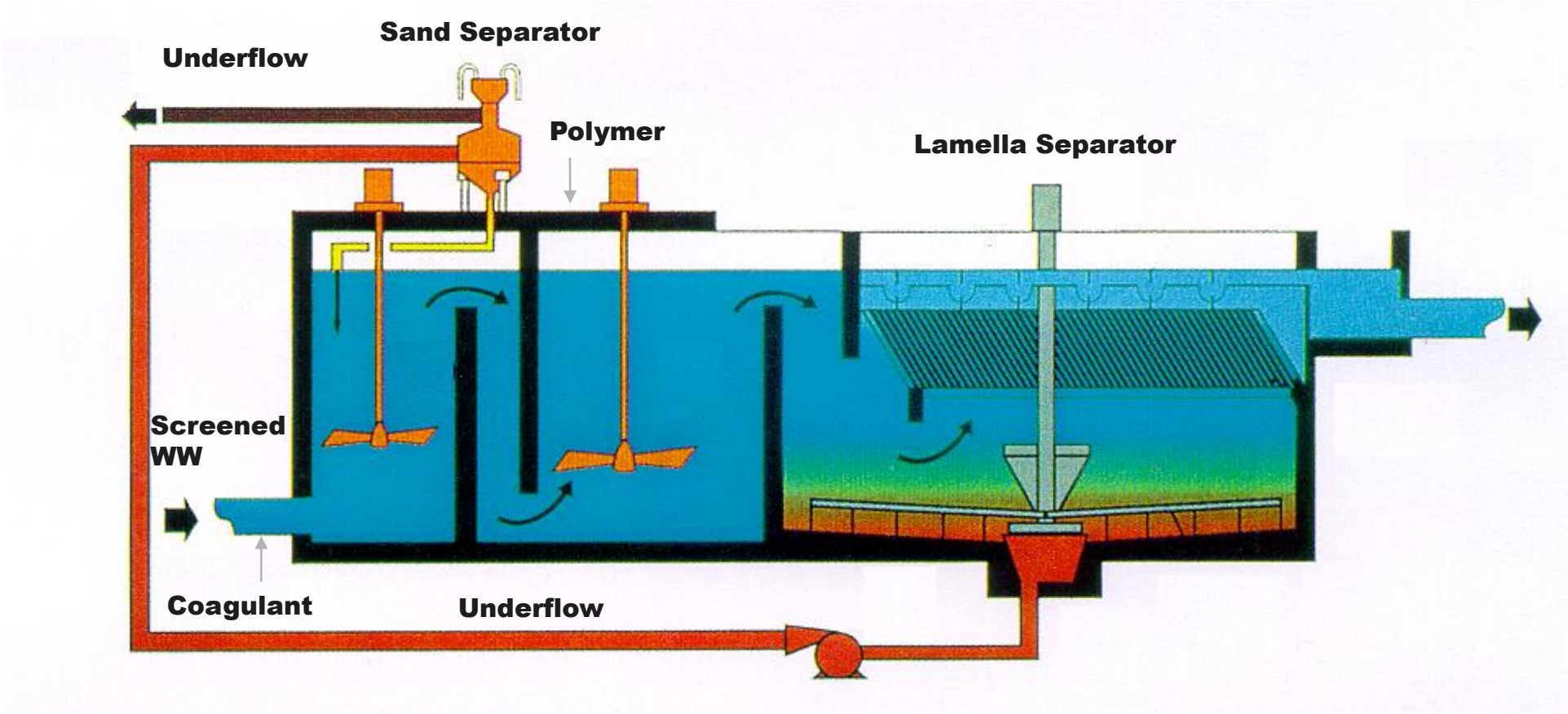
One Example of Ballasted Treatment - Actiflo®



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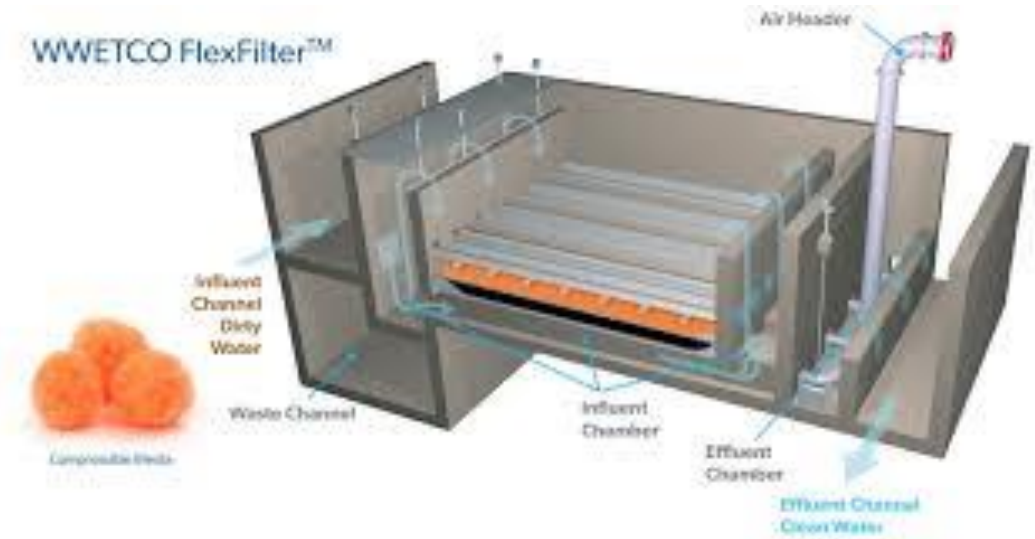
Effluent Filters for Dry + Wet Weather Treatment

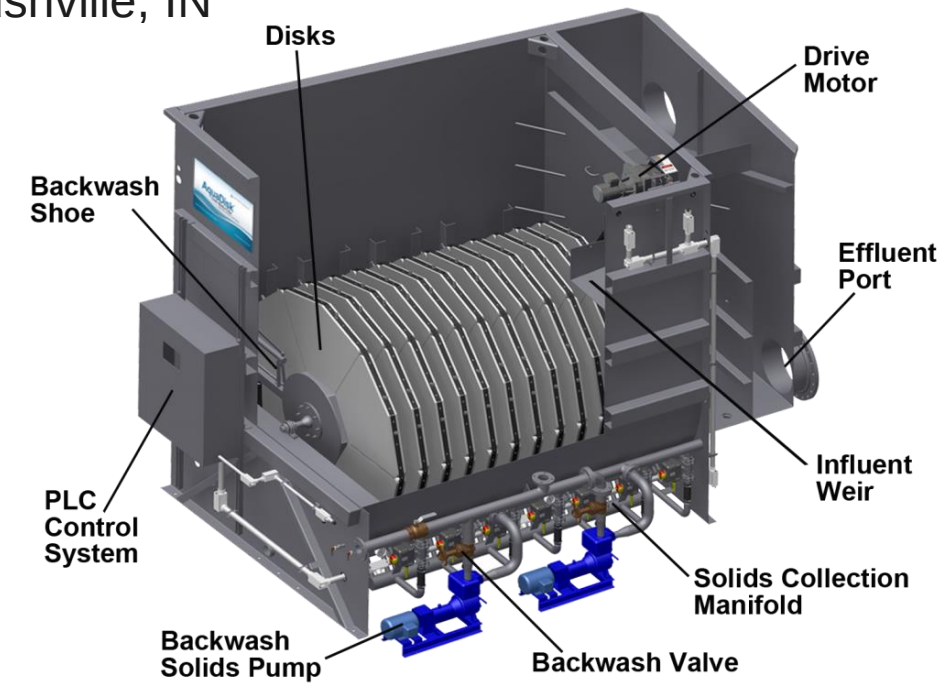
Compressible Media

Springfield, Ohio



Cloth Filter – Aqua Aerobics

Rushville, IN



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